Remote-Controlled Potentiometer For Audio Applications

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AVT 594

ASSEMBLY DIFFICULTY

The device is perfectly suited to any audio amplifier equipped with a standard 'manual' potentiometer. This circuit can be controlled by virtually any infrared remote control, requiring only a simple remote code memorisation procedure. It was tested with several pilots from different televisions, decoders, DVDs and audio equipment - with each it worked properly. Any button on the remote control can be assigned to one specific function: turn left (volume down), turn right (volume up) or on/off. This makes it possible to use remote control buttons normally not used. The controller is a versatile circuit. After the exchange of the potentiometer for a geared motor, it can control, for example, window blinds.

Characteristics

- remote control by any infrared remote control
- simple teaching mode for remote controller
- ability to assign any remote control keys for three functions:
  - turn anticlockwise
  - turn clockwise
  - control of integrated relay (e.g., ON/OFF)
- power supply: 12 VDC
- remote control and potentiometer with motor included

Circuit description

Electrical diagram of the circuit is shown in Figure 1. The controller is built on an 8-lead microcontroller ATtiny45, which is equipped, among other things, with a non-volatile EEPROM where codes will be stored for individual commands that control the circuit operation. Components R2, C2 are responsible for resetting the processor during power on. The microcontroller does not require any external quartz resonator as it has an integrated RC generator. The TFMS5360 infrared receiver is connected to the PB4 input of the processor. Light emitting diode D1 is used to signal the status of relay PK1 controlled by transistor T7 from output PB2 of the processor, it also has a useful function when teaching codes sent by the remote control. This circuit must be supplied with a DC voltage of approx. 14 VDC. The digital part of the device is powered by +5 VDC, supplied by the US2 voltage stabiliser. Each received command coming from the transmitter is analysed by the processor. If it corresponds to one of the predefined commands, the motor is set in motion for the time specified by the transmission time and in set direction. Each received command assigned to relay PK1 changes its state to the opposite. The relay type RM96 is designed for switching currents of up to 8 A, which

in most cases is enough to activate amplifier circuits. Diode D2 protects transistor T7 from the effects of surges occurring on the relay coil at the time of switching off. The executive part is a typical bidirectional DC motor controller, whose operation is controlled by two digital signals. The motor was incorporated in a diagonal bridge formed by power transistors of type BD139 and BD140. Appearance of a high state at the PB0 output of US1 will polarise transistor T5, as well as transistors T4 and T1. Current will flow through the path: +power supply, transistor T1, motor winding , transistor T4 and power supply ground. Motor connected to the CON1 connector will start to rotate in one direction. Similar situation takes place if the transistor T6 is polarised, except that the motor starts to rotate in the opposite direction.

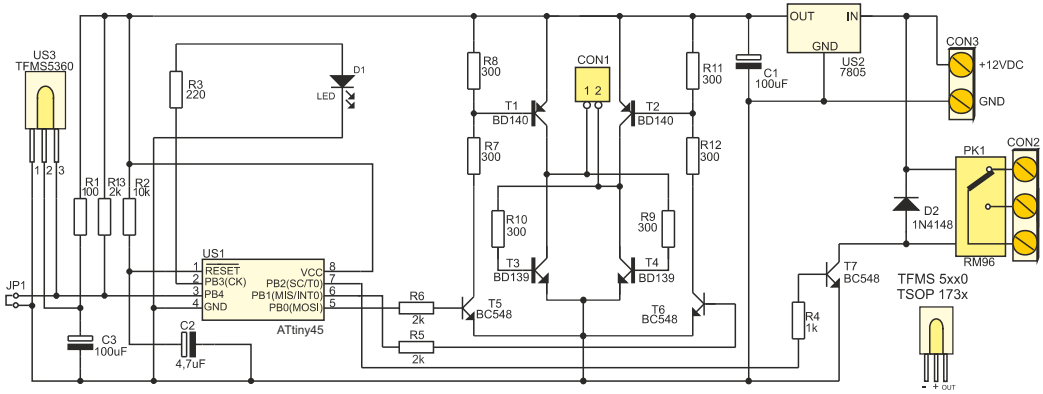

Fig. 1 Schematic diagram

Mounting and start-up

Arrangement of the components on the PCB is shown in Fig. 2. Start mounting the circuit from soldering resistors on the board, processor socket, capacitors and finish by mounting the transistors, infrared receiver and relay, if you choose to use it. Figure 3 shows the controller leads. Module assembled from proven components requires no adjustment, and once the commands sent by the remote control have been recorded it is immediately operational.

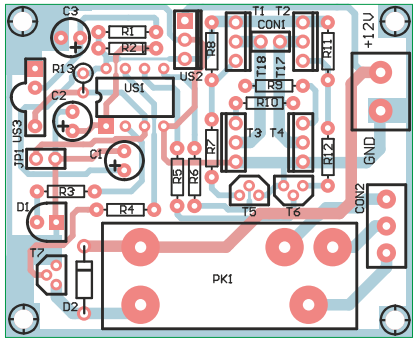

Fig. 2 Arrangement of components on the PCB.

Teaching remote codes

To save control commands in the memory, jumper JP1 must be shorted for about 5 seconds. The teaching mode will be signalled by the LED on, and after you remove the jumper, the LED will start flashing, then the potentiometer will turn slightly anticlockwise. Now, the circuit waits for two commands from remote control, which will be responsible for reducing the volume level. In

most cases, you want that only one button had this function, so it had to be pressed twice. Such action is needed for correct operation with some remote controls. After each correctly received code, the diode is longer on. After the second code, the potentiometer will turn clockwise to signal the next configuration step - increasing the volume level, you must now press twice (each time after confirmation by the circuit) corresponding key on your remote control. After this action, the relay will switch on briefly, which is an incentive to enter the command responsible for its switching on. Once all six commands have been received, the circuit will return to normal operation with new settings.

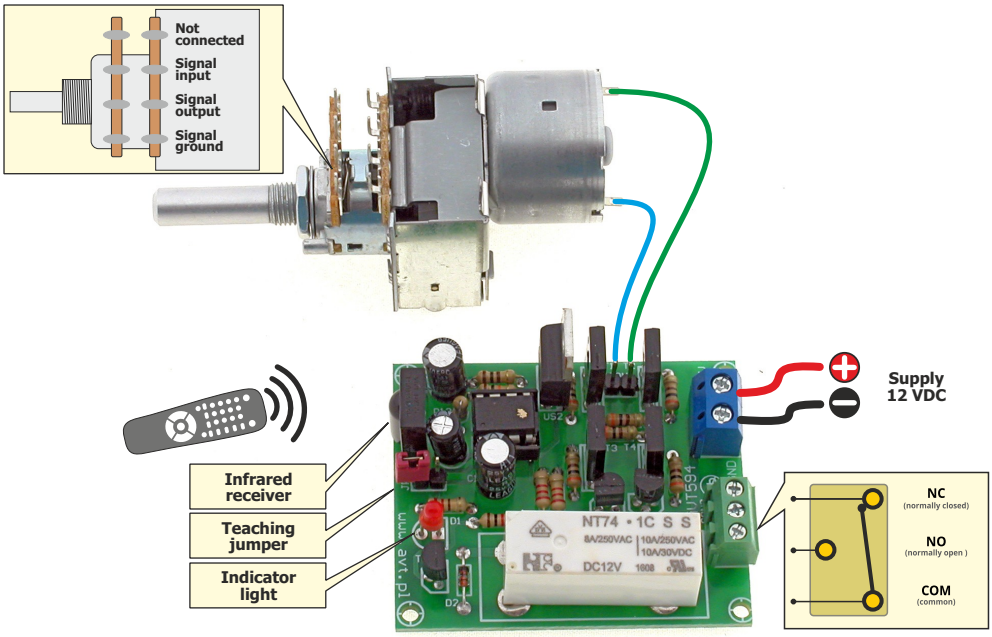

Fig. 3.

List of components

Resistors

R1: ..... 100 Ω
R2: ..... 10k Ω
R7, R8, R9, R10, R11,R12: ..... 300 Ω
R3: ..... 220 Ω
R4: ..... 1 kΩ
R5, R6, R13: ..... 2 kΩ

Capacitors

C1, C3: ..... 100 uF / 16V
C2: ..... 4,7 uF /16V

Semiconductors

US1: Attiny45
US2: 7805
US3: ..... TFMS5360 or similar
T1, T2: BD140
T3, T4: BD139
T5, T6, T7: BC547
D1: ..... LED
D2: 1N4148

Other

PK1: ..... RM96P12 or equivalent
JP1: ..... Jumper + goldpin 1×2
ARK2/500
ARK3/500 3.5mm
Rotary potentiometer with motor
Any infrared remote control

Notes

AVT SPV Sp. z o.o.

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